Illuminating Development

Commercial Benefits—Spinoffs

How best to keep an eye on high-temperature processes where extreme brightness might otherwise obscure the view?

Initiated by support from Small Business Innovation Research (SBIR) funds from the Glenn Research Center, Control Vision, Inc., of Idaho Falls, Idaho, has commercialized a series of laser-augmented, video sensor technologies.

Control Vision's first product line, LaserStrobe®, was developed under a NASA SBIR effort over 12 years ago. This novel equipment yields clear, high-resolution, real-time video imaging of high-temperature, high-energy industrial processes. Welding, plasma arc spraying, arc furnaces, metal casting, and refractories melting are among the processes that LaserStrobe® can monitor. The Control Vision systems use reflected laser or strobe illumination, combined with ultra-short double exposure techniques, that allow for particle imaging velocimetry of fast-moving powder particles buried within a plasma stream.

Basically, with LaserStrobe®, the laser pulse creates the video image while ignoring the brightness coming from the process. The sensor is essentially

Control Vision, Inc.'s LaserStrobe® and PyroCam® systems can yield high-resolution video images of high-energy industrial processes.

blind to the radiation coming from the process. The rapid-fire laser pulse also freezes powder particles in flight.

The LaserStrobe® is well suited for conventional welding, laser welding, and other laser-driven processes, as well as thermal spray, metallurgy, and ceramics research.

A few years ago, the company introduced the PyroCam® line of imaging systems. PyroCam® technology was originally developed for Nd:YAG laser welding processes and was derived from research and development efforts also funded under the NASA SBIR program.

The PyroCam® system includes a small sensor head, a xenon strobe illumination unit, and a microprocessor-based controller unit. Since its introduction, Control Vision has found motion analysis applications for PyroCam®, such as observation of machining operations. Additionally, high-temperature applications, such as viewing ceramics within a high-temperature furnace, have been made feasible by PyroCam®. The system works well for peeking in on processes where temperatures can be as high as 2000 degrees Centigrade. PyroCam® has been used in steel mills to observe processes like melting, continuous casting, hot rolling, and cutting.

NASA's interest in PyroCam® has recently increased, specifically to tap into the equipment's attributes that allow more cost-effective in-process weld inspection of aluminum-lithium or other alloy materials to be used in the Space Shuttle's Lightweight External Tank. The system is expected to assist NASA in the quality and cost efficiency of Space Shuttle External Tank assembly work at the space agency's Michoud plant in New Orleans, Louisiana.

Under a recent contract with NASA, Control Vision has developed a new version of the LaserStrobe® system. This newer device, the Model 4Z, replaces the conventional controls of its earlier counterpart with all-digital, computerized controls. Model 4Z's optics package provides users a variety of magnifications and close-up optics with varying standoff distances to accommodate research needs. Each of the two compact pulsed nitrogen lasers includes a fiber optic cable that is used to deliver the laser illumination to the area being watched. This technology has significantly added to the theoretical and scientific knowledge of plasma diagnostics and plasma processing.

Control Vision's leadership in high resolution, real-time imaging of high temperature processes is proving itself in both private sector and governmental research and development projects. ❖